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Sir:

Transmitted herewith for filing is the patent application of
Inventor: Patrick McErlean
For: ELECTRONIC MESSAGE DISTRIBUTION

Enclosed are:

- ☒ 7 sheets of drawing.
- ☒ An assignment of the invention to AMACIS LIMITED
- ☒ A Declaration and Power of Attorney.
- ☒ A verified statement to establish small entity status under 37 CFR 1.9 and 37 CFR 1.2
- ☐ Claim to Right of Priority w/certified copy of ___ application no(s). ___
- ☐ This application claims the benefit of U.S. Provisional Application No. ___ filed ___


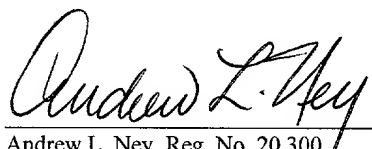
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Total Claims	30-20=	10	x \$9	\$90	OR	x \$18	\$ 0
Indep Claims	4-3=	1	x \$40	\$40	OR	x \$80	\$
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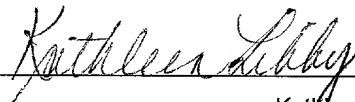
<input checked="" type="checkbox"/> Customer Number or Bar Code Label Or <input type="checkbox"/> Correspondence address below	Insert Customer No. or Attach bar code label here  23122 PATENT TRADEMARK OFFICE	Respectfully submitted,  Andrew L. Ney, Reg. No. 20,300
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tmb

EXPRESS MAIL Mailing Label Number: EL 711 312 105 US

Date of Deposit: October 19, 2000

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Kathleen Libby

Serial or Patent No.: To Be AssignedFiled or Issued: HerewithFor: ELECTRONIC MESSAGE DISTRIBUTION

**VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY
STATUS (37 CFR 1.9(f) and 1.27(c) - SMALL BUSINESS CONCERN**

I hereby declare that I am

☐ the owner of the small business concern identified below:☒ an official of the small business concern empowered to act on behalf of the concern identified below:NAME OF CONCERN Amacis LimitedADDRESS OF CONCERN Falcon Road, Belfast, Northern Ireland, United Kingdom

I hereby declare that the above identified small business concern qualifies as a small business concern as defined in 13 CFR 121.3-18, and reproduced in 37 CFR 1.9(d), for purposes of paying reduced fees under Section 41(a) and (b) of Title 35, United States Code, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when either, directly or indirectly, one concern controls or has the power to control the other, or a third-party or parties controls or has the power to control both.

I hereby declare that rights under contract or law have been conveyed, to and remain with the small business concern identified above with regard to the invention, entitled ELECTRONIC MESSAGE DISTRIBUTION by inventor(s) Patrick McErlan described in

☒ the specification filed herewith.☐ application serial no. __, filed __☐ patent no. __, issued __

If the rights held by the above identified small business concern are not exclusive, each individual, concern or organization having rights in the invention is listed below* and no rights to the invention are held by any person, other than the inventor, who could not qualify as a small business concern under 37 CFR 1.9(d) or by any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).

*NOTE: Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities. (37 CFR 1.27)

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I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small business entity is no longer appropriate. (37 CFR 1.28(b)).

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

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CERTIFICATE OF MAILING BY "EXPRESS MAIL" (37 CFR 1.10)

Applicant(s): Patrick McErlean

Docket No.

FKC-102US

Serial No.
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Herewith

Examiner

Group Art Unit

Invention: **ELECTRONIC MESSAGE DISTRIBUTION**JCS 3 U.S. PTO
09/691936

I hereby certify that the following correspondence:

1082; Specification (42 pgs.); Drawings (7 sheets); Decl/POA (2 pgs.); Statement Claiming Small Entity Status; 1595; Assignment (3 pgs.); 2 checks; Postcard*(Identify type of correspondence)*

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October 19, 2000*(Date)***Kathleen Libby***(Typed or Printed Name of Person Mailing Correspondence)**(Signature of Person Mailing Correspondence)***EL 711 312 105 US***("Express Mail" Mailing Label Number)***Note: Each paper must have its own certificate of mailing.**

Electronic Message Distribution

5 FIELD OF THE INVENTION

The present invention relates to electronic message distribution. The invention relates particularly to the distribution of electronic messages which may fall within
10 more than one different message classes or categories.

BACKGROUND TO THE INVENTION

Many organisations are now equipped to receive messages,
15 including orders and enquiries, by electronic means. Typically, such electronic messages take the form of text-based messages, for example e-mails, delivered by a global computer network, for example the Internet, or by a telecommunications network, for example a mobile telephone
20 network. Each message must be processed and dealt with appropriately i.e. according to the nature of the message. In many cases, the volume of received electronic messages is relatively high and it is considered inefficient to process each message manually.

25

For this reason, it is known for electronic message processing systems, typically in the form of a computer system, to employ a text analyzer, such as IBM's Mail Analyzer, to analyse the content of electronic messages in
30 order to classify, or categorize, each message according to its content. Once a message has been categorized, the processing system sends it on to a human agent who has the skills necessary to deal with messages falling within the

relevant category(s). Alternatively, the computer system itself may be able to deal with messages falling within certain category(s).

5 Typically, a text analyzer examines the text of each message in turn in search of one or more alphanumeric text string, for example a word or sequence of words, which may be used to identify the purpose or nature of the message under examination. Normally the text analyzer operates in
10 association with a rule engine to apply a set of rules to the message in order to determine how to categorize the current message.

By way of simplistic example, a banking organisation may
15 have a message processing system arranged to receive electronic messages in three different categories, namely: balance enquiry; request for funds transfer; and interest rate enquiry. In order to categorize each received message, a text analyzer in association with a rule engine
20 applies a set of four rules to each message in turn. The first rule stipulates that if the text string "balance" appears in the message, then the message falls in the balance enquiry category. The second rule stipulates that if the text strings "funds" and "transfer" appear in the
25 message, then the message falls in the funds transfer category. The third rule stipulates that if the message contains the text string "interest rate", then the message should be categorized as an interest rate enquiry. The fourth rule stipulates that if none of the previous rules
30 are satisfied, then the message is deemed unclassified.

Clearly, a message may fall within more than one category.

For this reason, some conventional text and analyzers, including the IBM mail analyzer are capable of generating a set of more than one categories in which a given message is deemed to fall. Further, such text analyzers normally
5 associate with each category in the set an indication of the level of confidence with which the text analyzer has determined that the message falls within that category. Typically, the confidence level is expressed as a percentage.

10 Once categorization is complete, the message has to be distributed to a human agent, or a computer (automated) agent, that is capable of dealing with messages falling within the relevant category or categories. There is a
15 problem, however, in that an agent may not have the capability to deal with all of the categories into which a given message falls. This is particularly true for large organisations which may receive messages falling in one or more of tens or even hundreds of categories, and where
20 each agent employed by the organisation is only trained to deal with a subset of those categories.

Conventionally, an e-mail processing system includes a distributor which is arranged to determine which category
25 has been assigned to a given message with the highest confidence level. The distributor then selects an agent that is capable of dealing with said category and forwards the message on to him (or it).

30 Upon receipt of the message, the agent duly deals with those aspects of the message that he can. If a message includes further aspects which fall within a category or categories that the agent cannot deal with, the onus is on

the agent to recognise this and to forward the message, together with the part-response that the agent was able to prepare, to another agent who does have the capability to deal with one or more of the outstanding categories.

5

This is problematic since the agent may not recognise that there are other aspects of the message which require attention or may simply fail to forward the message on to another agent. This can result in a response being
10 returned to the customer (from which the message emanated) which only partly deals with the various orders or requests made in the message. This can be frustrating to the customer and damaging to the organisation as it may result in loss of business.

15

SUMMARY OF THE INVENTION

In accordance with a first aspect of the present invention there is provided an electronic message distributing
20 apparatus for distributing electronic messages from a database to one or more agents, the database storing, in respect of each electronic message to be distributed, a set of one or more message classes into which the respective electronic message is deemed to belong, the
25 distributing apparatus comprising: means for determining, from said database, at least one message class in which an electronic message is deemed to belong; means for selecting, from a directory of one or more agents, an agent that has a capability to process electronic messages
30 that belong to said at least one message class; means for causing said electronic message to be rendered to said selected agent for processing thereby; and means for receiving from said selected agent a signal indicating

that said electronic message is processed; wherein, upon receipt of said signal, the distributing apparatus is arranged to determine, from said database, if said set includes one or more message classes in respect of which said electronic message is not processed and, in response to determining that said electronic message has not been processed in respect one or more message classes in said set, is arranged to select a further agent to which to cause said electronic message to be rendered, which further agent has a capability to process messages which belong to one or more of said unprocessed message classes.

Thus, the distributing apparatus of the present invention ensures that a given electronic message which falls within multiple message classes is dealt with, or processed, in respect of all of said classes for which there is a capable agent. The distributing apparatus distributes a message to a plurality of agents if necessary until it determines that all aspects of the message which can be dealt with, are dealt with. The onus on the agent to forward the message to other agents is removed. Hence, the likelihood that an inadequate reply message will be sent to a customer is greatly reduced.

In a preferred embodiment of the invention, each message class comprises a respective message group, each message group comprising one or more message categories. It is preferred to define one or more basic message categories into groups as this simplifies the distribution process.

More preferably, it is assumed that when a message is sent to a particular agent in respect of a particular message class, or group, that the agent also deals with any other

aspects of the message which fall into classes or groups which the agent is capable of dealing with.

A second aspect of the invention provides an electronic message processing system for distributing electronic messages amongst a plurality of agents, the system comprising:

a database arranged to store, in respect of each electronic message to be distributed, a set of one or more message classes into which the respective electronic message is deemed to belong; and

a directory of one or more agents, said directory including, in respect of each agent, a set of one or more message classes in respect of which the respective agent has a capability of dealing with electronic messages;

a distributing apparatus arranged to distribute electronic messages to one or more of said agents, the distributing apparatus comprising:

means for determining, from said database, at least one message class in which an electronic message is deemed to belong;

means for selecting, from said directory, an agent that has a capability to process electronic messages that belong to said at least one message class;

means for causing said electronic message to be rendered to said selected agent for processing thereby; and

means for receiving from said selected agent a signal indicating that said electronic message is processed;

5 wherein, upon receipt of said signal, the distributing apparatus is arranged to determine, from said database, if said set includes one or more message classes in respect of which said electronic message is not processed and, in response to determining that said electronic message has
10 not been processed in respect one or more message classes in said set, is arranged to select a further agent to which to cause said electronic message to be rendered, which further agent has a capability to process messages which belong to one or more of said unprocessed message
15 classes.

In a preferred embodiment, the database includes a first set of data records each data record including means for identifying the respective message to which it relates and
20 means for identifying a respective message class in which said respective message is deemed to belong. The first set of data records, which hereinafter is referred to as a workflow table, serves as a list of all electronic messages which have been received by the electronic
25 message system and which have undergone classification. Preferably, each data record includes a status identifier for indicating whether or not the electronic message to which said data record relates has been processed in respect of the message classification noted in the data
30 record.

Preferably still, all data records which relate to the same electronic message, are prioritised with respect to

one another. Further preferably, the prioritisation is determined on the basis of the level of confidence with which the electronic message is classified into the respective message classes.

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Preferably, the system includes a second set of data records, each data record in the second set also including means for identifying the respective message to which it relates and means for identifying a respective message class to which said respective message is deemed to belong. The second set of data records, hereinafter referred to as the distributor control table, serves as a list of electronic messages or part-messages, which are awaiting distribution by the distribution apparatus.

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A third aspect of the invention provides a method of processing electronic messages in the electronic message processing system of the second aspect of the invention.

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A fourth aspect of the invention provides a computer program product comprising computer program code stored on a computer usable storage medium for performing the method of the third aspect of the invention.

25

Other aspects of the present invention will become apparent to those ordinarily skilled in the art upon review of the following description of a specific embodiment of the invention and with reference to the accompanying drawings.

30

BRIEF DESCRIPTION OF THE DRAWINGS

5 An embodiment of the invention is now described by way of example and with reference to the accompanying drawings in which:

10 **Figure 1** is a schematic view of a communications network including a electronic message processing system;

Figure 2 is a more detailed schematic view of the electronic message processing system of Figure 1;

15 **Figure 3** is a schematic representation of data tables, arranged in accordance with the present invention, held within a database of the electronic message processing system of Figure 1;

20 **Figure 4** is a flow chart illustrating the operation of a classifier, in accordance with the present invention, included in the system of Figure 1;

25 **Figure 5** is a flowchart illustrating the operation of a distributor, in accordance with the present invention, included in the system of Figure 1;

Figure 6 is a continuation of the flowchart of Figure 5; and

30 **Figure 7** is a schematic representation of electronic message categories and groups arranged for use with the present invention.

DETAILED DESCRIPTION OF THE DRAWINGS

With reference to Figure 1 of the drawings, there is
5 shown, generally indicated at 10, a communications network
for the transmission of electronic messages 12. The
network 10 includes a global computer network 14, such as
the Internet, and a mobile telephone network 16 but, in
general, may include any computer network and/or
10 telecommunications network, including WAN, LAN or MAN
networks. The electronic messages 12 typically take the
form of, for example, e-mails, Web-page forms, SMS (Short
Message Service) text messages, as commonly used by mobile
telephones, or the like. It will be understood that the
15 present invention is not limited for use with any
particular such type or types of electronic messages.

The electronic messages 12 are transmitted across the
communications network 10 in conventional manner using,
20 for example, a mail server 20, Web server 22, servlet 24
and/or WAP (Wireless Application Protocol) gateway 26, as
appropriate, and using conventional transmission protocols
such as, WAP, HTTP (Hyper Text Transfer Protocol), SMTP
(Simple Mail Transfer Protocol), POP (Post Office
25 Protocol), or other suitable protocol. It will be
understood that the invention is not limited to use with
any particular transmission means or protocols.

The electronic messages 12 are received by a message
30 processing system 18 which may reside, for example, on an
organization's computer system (not shown) or an ASP's
computer system (not shown). The message processing
system 18 includes means for receiving electronic messages

in conventional manner which, in the example of Figure 1, includes an e-mail receiving module 28, an SMS receiving module 30 and a database 32 for storing received messages 12.

5

In the example illustrated in Figure 1, the e-mail receiver 28 is arranged to receive e-mails in two ways. The first is directly from an ISP (Internet Service Provider) using SMTP, the second is via the mail server 20 using POP3. The e-mail receiver 28 is further arranged to receive Web-page form messages through the web server 22. Web-page form messages may be considered as structured e-mails which call the servlet 24 in the web server 22 which in turn converts the Web-page form content into an e-mail which is subsequently sent to the e-mail receiver 28 using SMTP.

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Web-page forms from the mobile network 16 are transmitted using a WAP protocol stack to the WAP gateway 26. The WAP gateway 26 converts the Web-page form into an HTTP request, which is then processed by the web server 22 and servlet 24 as described above. SMS messaging from the mobile network 16 is conveniently transmitted using WAP to the SMS receiver 30.

25

Thus, the e-mail receiver 28 and the SMS receiver 30 are arranged in conventional manner to support the appropriate transmission protocols which, in the example of Figure 1, are SMTP and POP3 for the e-mail receiver 28, and WAP (SMPP) for the SMS receiver.

30

The communications network 10 of Figure 1 is given by way of example only to provide a typical context for the invention and is not limiting to the invention.

5 Referring now to Figure 2, the message processing system 18 is shown in more detail. Electronic messages 12 received by the e-mail receiver 28 and SMS receiver 30 are stored in database 32. A classification module 34, or classifier, retrieves each message 12 from the database 32
10 in turn. The primary function of the classifier 34 is to classify, or categorize, each message 12 into one or more categories depending on the content of the message 12. To this end, the classifier 34 is associated with, or includes, a text analyzer 36, for example the IBM Mail
15 Analyzer and is further associated with, or includes, a rule engine.

Once classified (or categorized), each message is returned to the database 32 by the classifier 34 together with the
20 determined classification information and, preferably, with information as to where the message should be routed in view of its classification. For example, messages 12 falling within certain categories may require to be dealt with by a human agent (not shown) with particular skills,
25 while messages 12 falling within other categories may be dealt with automatically by a virtual agent 38.

A distributor module 40, or distributor, retrieves the categorized messages and distributes them either to the
30 virtual agent 38 or a mail client 42, according to the respective categorization and/or routing information. The virtual agent 38 includes one or more software routines which automatically generate an appropriate response to a

message 12 according to its categorization information.

The mail client 42 provides the message 12 to a human operator, or agent, who then prepares an appropriate response. Once a final response is prepared, the

5 distributor 40 marks the response as complete and causes it to be stored in the database 32. Figure 2 only shows one mail client 42 and one virtual agent 38 although in practice there may be a plurality of each.

10 A composing module 44, or composer, retrieves responses from the database 32 that are marked as complete and composes a respective response message (not shown) for reply to the originator (not shown) of the respective received message 12. The composer 44 typically fulfils
15 any attachment requirements as well as adding the appropriate Internet, or other, protocol information. Each composed response message is then returned to the database 32.

20 An e-mail dispatch module 46, or dispatcher, retrieves from the database 32 the composed response messages which are destined to be transmitted by e-mail and conveniently dispatches them to an ISP (not shown) using SMTP. An SMS
25 dispatch module 48, or dispatcher, retrieves from the database 32 the composed response messages which are destined to be transmitted as SMS messages and dispatches them to the mobile network 16 using SMPP protocol.

Conveniently, the modules of Figure 2 take the form of
30 CORBA (Common Object Request Broker Architecture) modules, or servers written, for example, in the Java programming language. Each module may reside on a single computer or may be distributed across a computer system, as is

convenient. The e-mail receiver 28, SMS receiver 30, virtual agent 38, mail client 42, composer 44, e-mail dispatcher 46 and SMS dispatcher 48 are generally conventional in configuration and operation and are not limiting to the present invention.

The text analyzer 36 is of the type which is capable of generating multiple categories for a given message. IBM'S mail analyzer is an example of such a text analyzer. One aspect of the present invention is concerned with the arrangement and interaction of the classifier 34 and the distributor 40 for dealing with messages that fall within more than one category, as is now described in more detail.

When an electronic message is processed by the text analyzer 36, the text analyzer 36 applies, in conventional manner, a set of rules to the content of the electronic message in order to determine the nature of the message. In this way, the text analyzer 36 is able to classify, or categorise, the electronic message according to its content. Some messages may include more than one type of question or request and may therefore fall into more than one different class or category. For example, a customer (not shown) of a banking organization may send in an e-mail message which comprises both a balance enquiry and a request for a funds transfer, each of which may be deemed to fall in a respective different category. The text analyzer 36 is therefore arranged to generate one or more categories for each message that it processes, depending on the content of each message. The text analyzer 36 is further arranged to assign to each category that it generates, an indication of the level of

confidence it has that the categorisation is correct. The confidence level is typically expressed as a percentage.

With reference now to Figure 4, the classifier 34 is arranged to receive, for each electronic message, the or each category generated by the text analyzer 36 (module 401). At module 402, the classifier 34 arranges the or each category generated by the text analyzer 36 in order of confidence level. Table 1 illustrates an example where for a given electronic message (not shown), the text analyzer 36 generates a set of five categories, namely categories 1, 4, 5, 6, 8, in which it deems that the message belongs. Each category is associated with a respective confidence level expressed as a percentage.

CATEGORY	CONFIDENCE LEVEL	GROUP
6	98%	A
4	87%	C
1	86%	B
5	73%	C
8	64%	A

Table 1

ORDER	CATEGORY	GROUP
1	6	A
2	8	A
3	4	C
4	5	C
5	1	B

Table 2

In the preferred embodiment, the categories are further arranged in groups and a group may embrace more than one category. An example of this arrangement is given in Figure 7 in which categories 6 and 8 are defined as

5 belonging to group A, categories 1 and 3 are defined as belonging to group B and so on. Figure 7 is a simplistic example in which there are only 8 categories and 4 groups in total. In practice there may be, for example, hundreds of categories distributed amongst tens of groups. While
10 the arrangement of categories into groups is not essential, it is preferred since it simplifies the routing of messages to agents particularly in cases where there are a relatively large number of categories.

15 In Table 1, the categories are arranged in decreasing order of confidence level and each category is further associated with its respective group which, in the present case, is either A, B or C. Table 1 is the result of the classifier's activity under module 402.

20 At module 403, the classifier 34 re-orders the generated categories according to both group and confidence level. This is illustrated in Table 2 where category 6, being the category having the highest confidence level, is placed at
25 the top of the table. Category 8 is placed next in Table 2 as it is also in group A but has a lower confidence level than category 6. The third entry in Table 2 is category 4 which has the next highest confidence level after category 6 but is in group C rather than group A.
30 Category 5 is positioned next in Table 2 as it belongs to the same group as category 4 but has a lower confidence level and, finally, category B takes up last position in the table. When the categories are so ordered, they are

each assigned a respective order number or sequence number. Thus, a given electronic message is associated with a set of one or more categories which are ordered in a sequence according to the level of confidence with which each category has been assigned and, preferably, also according to the group into which each category falls, each category in the sequence having an order number or sequence number which identifies its position in the sequence.

It will be understood that there may be any number of different categories and/or groups. The illustrations given in Table 1 and 2 and Figure 7 show only a simplistic example where there are eight categories and four groups.

With reference now to Figure 3, the database 32 includes a first set of data records, hereinafter referred to as the workflow table 302, each data record, or entry 303, including a message identification element (in the "ID" column of the workflow table 302), a group identifier (in the "GROUP" column in workflow Table 302), one or more category identifiers (in the "CAT" column in table 302) a sequence number identifier (in the "ORDER" column in workflow table 302) and a status indicator (in the "STATUS" column in workflow table 302).

It will be understood that the workflow table entries 303 need not necessarily include both a group identifier and a category identifier. In general, each workflow table entry should include a message class, or category, identifier or other means suitable for determining to which agent the corresponding message should be routed, or distributed. Thus, the database 32 stores, in respect of

each electronic message to be distributed, a set of one or more message classes into which the respective electronic message is deemed to belong. The arrangement of Figure 3 (i.e. the inclusion of both group and category identifiers) is preferred. As will be understood from the following description, the group identifier serves as a means for determining to which agent the corresponding message should be distributed, or routed, while the, or each, category identifier determines how the agent should respond to the message.

Referring again to Figure 4, at module 404, the classifier 34 creates an entry 303 to the workflow table 302 for each group generated by the text analyzer 36 for a given message. For example, the message for which Table 2 is generated is designated with the message identifier *message1*. The classifier 34 thus generates three workflow table entries 303, each including the message identifier *message1*, a respective group identifier, one or more respective category identifiers, a respective sequence number and a respective status identifier. When the workflow table entries 303 are first created by the classifier 34, they are each given a status identifier which indicates that the entry 303 has not yet been processed by the distributor 40. In the present example the status identifier "U" is used to indicate an unprocessed workflow table entry 303, while the status identifier "P" is used to indicate that the workflow table entry 303 has been processed by the distributor 40.

The classifier 34 creates one or more workflow table entries 303 for each message that it receives and processes (classifies). In Figure 3, the workflow table

302 contains entries 303 for a plurality of messages, *message1* to *messageN*. In Figure 3, the entries 303 are shown to be ordered according to message identifier, but this need not necessarily be the case.

5

The database 32 further includes a second set of data records, hereinafter referred to as the distributor control table 304. The distributor control table 304 comprises a plurality of data records, or entries 305, each relating to a message, or part-message, which requires distribution to an agent by the distributor 40. In the present example, the entries 305 are arranged in queue order i.e. the order in which they are to be processed by the distributor 40. Each distributor control table entry 305 includes a queue number (which may conveniently be allocated on a first-come-first-served basis), a message identifier (ID) and a class identifier. It will be understood that order in which the entries 505 in the distributor control table 304 are processed, or distributed, by the distributor 40 need not necessarily be on a first-come-first-served basis and will depend on the distribution policy being implemented by the distributor (for example some groups may be given priority over others). The distributor control table 304 therefore represents a list, conveniently in queue order, of messages or part-messages which are to be processed, i.e. distributed, by the distributor 40. Each entry 505 further includes a status indicator for indicating whether the entry 505 is unprocessed (U), processed (P) or in progress (I).

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Referring again to Figure 4, at module 405, the classifier 34 creates a distributor control table entry 305 for each

message that it classifies. In the preferred embodiment, the classifier 34 creates only a single distributor control table entry 305 - corresponding to the group which it has placed first in the sequence of categories - for each message. Thus, in the example of Table 2, the classifier 34 creates a single distributor control table entry 305 corresponding to group A. The control table entry 305 comprises the message identifier *message1*, a group identifier for group A and two category identifiers, one for category 6 and one for category 8. Thus, the respective sequence numbers or order numbers serve as a priority identifier as they indicate the relative priority of table entries 303 which relate to a given message.

The database 32 further includes a directory 306 of one or more agents that are available for selection by the distributor 40 and to which the distributor 40 may distribute or transmit a given electronic message for processing. The agent directory 306 includes a data record, or entry 307, for each agent, each entry 307 including an agent identifier (Agent ID), an indication of the capability of the agent which, in the preferred embodiment, comprises identification of the group(s) that the agent can deal with, and an indication of whether or not the agent is currently available to the distributor 40. This is illustrated in Figure 7, where Agent 1 (A1) can deal with groups A, B and D, Agent 2 (A2) can deal with group D only, and so on.

Referring now to Figures 5 and 6, the operation of the distributor 40 is now described. At module 501, the distributor 40 retrieves the distributor control table

entry 305 which is to be distributed next which, in the present example, is the one which is top of the queue.

At module 502, the distributor 40 marks the retrieved distributor control table entry 505 as being in progress. This is achieved by setting the respective status identifier to "I".

At module 503, the distributor 40 refers to the agent directory 306 and selects an agent that has the capability to process the group which is stipulated in the retrieved distributor control table entry 305, and which is currently available i.e. is not otherwise engaged, or absent.

The distributor 40 also determines from the agent directory 306 which other (if any) groups the selected agent can deal with. Then, at module 504, the distributor refers to the workflow table 302 to determine whether or not there are any further workflow table entries 303 for the current message being processed i.e. the message which corresponds to the retrieved distributor control table entry. In particular, the distributor 40 determines if there are any further workflow table entries 303 for said message which fall in a group that the selected agent can deal with.

By way of example, and with reference to Figure 3, the distributor 40 retrieves the first (Queue No.1) distributor control table entry 305 from the distributor control table 304. The distributor 40 is able to determine from the retrieved distributor control table entry 305 that the message to which the control table

entry relates is *message1* and that *message1* contains at least one query/request falling into group A. The distributor 40 then refers to the agent directory 306 to select an available agent who is capable of dealing with messages falling within group A. From the agent directory 306, the distributor 40 determines that *Agent1* is capable of dealing with group A but that *Agent1* is not currently available. The next available agent who is able to deal with group A is *Agent3*. The distributor 40 then selects *Agent3* to deal with *message1*. Before assigning *message1* to *Agent3*, the distributor 40 refers to the workflow table 302 to determine if there are any further workflow table entries 303 for *message1* which *Agent3* is also capable of dealing with. In the present example, the workflow table 302 includes one further entry 308 for *message1*, in which entry 308 *message1* is classified in group C. The distributor 40 knows from the agent directory 306 that *Agent3* is also capable of dealing with group C.

At module 505, the distributor 40 communicates the message corresponding to the retrieved distributor control Table entry 305 (in the present example *message1*) to the selected agent (in the present example *Agent3*), noting which group(s) the selected agent is able to process.

Conveniently, to communicate the message to the agent, the distributor 40 communicates to the agent's mail client 42 the message identifier and a list of the or each category that the agent is expected to deal with. The mail client 42 is then able to retrieve the message from the database 32 for rendering to the agent. In the example of *message1*, the distributor 40 communicates to the mail

client 42 that the agent is to deal with *message1* in categories 4, 5, 6 and 8.

Advantageously, the mail client 42 is also provided with a
5 respective set of one or more standard responses, or
replies, for each category. These standard responses are
conveniently pre-prepared by the organization operating
the message processing system 10 and stored locally to the
mail clients 42.

10 Thus, when the agent's mail client 42 receives the
category information from the distributor 40, it generates
a suggested reply to the customer containing all of the
standard responses which correspond to the relevant
15 category(s). The mail client 42 then renders the message
to the agent with its suggested response. The agent can
then review the message and amend the suggested response
as appropriate. It can thus be seen that the group
information in the workflow table 302 and distributor
20 control table 304 determine how a message (or part-
message) is routed or distributed, while the category
information determines what response is made by the agent.

Conveniently, the mail client 42 at which the agent
25 operates is arranged to allow the agent to signal to the
distributor whether or not a message is processed,
unprocessed and/or dismissed.

When the selected agent has finished processing the
30 message that has been distributed to him, the agent
signals to the distributor 40 that he has finished with
the message. The mail client 42 at which the selected

agent operates, is arranged then to cause the agent's response to be returned to the database 32.

At module 506, the distributor 40 checks whether or not it
5 has received a signal from the selected agent indicating that the message has been processed. If no such signal is received by the distributor 40, or if the selected agent sends an alternative signal indicating that the message has not been processed, then the distributor proceeds to
10 module 507 in order to establish whether or not the message has been dismissed by the selected agent.

If, at module 507, the distributor 40 determines that the message has not been processed by the selected agent, then
15 the distributor 40 returns to module 503 in order to select an alternative agent to send the message. If, at module 507, the distributor 40 determines that the message has been dismissed by the selected agent, then the distributor 40 refers again to the workflow table 302 and
20 removes all of the workflow table entries 303 which relate to the dismissed message (module 508). At module 509, the distributor 40 marks the distributor control table entry as completed, or processed.

25 If, at module 506, the distributor 40 determines that the selected agent has processed the message, then the distributor 40 proceeds to module 601 (Figure 6).

At module 601, the distributor 40 refers to the workflow
30 table 302 and updates the respective status indicator of each entry 303 which relates both to the message which has just been processed by the selected agent and to the, or each, group which said selected agent is capable of

processing. It does this by comparing the entries in the agent directory 306 with the group identifiers in the workflow table 302. In the example of Figure 3, the distributor 40 updates the status identifiers of the workflow table entries 303 for *message1* in group A and in group C. This is shown in Figure 3 by means of the letter 'P' in the status column, rather than the letter 'U'.

At module 602 the distributor 40 marks the distributor control table entry 505 as complete, or processed (P).

At module 603 the distributor 40 checks the workflow table 302 for further entries 303 which relate to the same message that has just been processed by the selected agent but for which the respective status indicator shows that that particular entry 303 is unprocessed. In the example of Figure 3, the workflow table 302 includes a further entry for *message1* in group B which has the letter 'U' in the status column indicating that it is unprocessed.

If at module 604, the distributor 40 determines that further unprocessed workflow table entries 303 do exist for said message, then the distributor 40 proceeds to module 605. At module 605 the distributor 40 determines which of the further unprocessed workflow table entries 303 has been ordered as the highest in priority i.e. which has the lowest sequence number or order number. In the example of Figure 3, the workflow Table entry 303 for *message1* in group B is the only further entry 303 for *message1* and so automatically enjoys highest priority. However, should there be a further entry 303 for *message1* in, say, group D which were assigned order number 4, then the distributor to 40 would select the entry 303 in group

B in preference over said hypothetical group D entry since the group B entry has a lower order number i.e. 3.

At module 606, the distributor 40 creates a new

5 distributor control table entry 305 for said next, or highest priority, unprocessed workflow entry 303. In the example of Figure 3, the distributor 40 creates a new distributor control table entry (not shown) for *message1* in group B. In the present example the distributor 40
10 places said new distributor control table entry in queue order i.e. in the case where there are currently N entries already in the distributor control table 304, said new distributor control table entry is placed at queue number N+1.

15 After module 606, control returns to module 501 (Figure 5) whereupon the distributor 40 retrieves the next entry from the distributor control table 304. In the present example, the next distributor control table entry 305 is
20 at number 2 in the queue and relates to *message2* in group B. Modules 502 to 606 are repeated in respect of the newly retrieved distributor control table entry 305.

In this way, the distributor 40 makes its way through the
25 distributor control table entries to 305 in queue order (or according to whatever other distribution policy is being implemented). In the present example, the distributor 40 will eventually encounter said new distributor control table entry at queue position N+1 in
30 the distributor control Table 304. Thus, the distributor 40 once more attends to the processing of *message1*, although this time to process *message1* in respect of those group(s) which were not dealt with by the previously

selected agent. Thus, the distributor 40 causes the message to be rendered to a further agent, which agent has the ability to process messages which belong to one or more of said unprocessed message groups. The process
5 continues until the message has been dealt with in respect of all message groups for which there is a capable agent.

In the present example, only those aspects of *message1* which relate to group B are outstanding. Modules 502 to
10 602 are repeated for the respective distributor control table entry and, conveniently, *Agent4* is selected on this occasion to deal with *message1* as *Agent4* has the capability to deal with group B. When module 604 is reached, the distributor 40 determines on this occasion
15 that there are no further workflow table entries for *message1*. The distributor 40 then proceeds to Module 607 in the assumption that the processing of *message1* is complete. At Module 607, the distributor causes *message1*, together with the response(s) prepared by *Agent3* and
20 *Agent4*, to be sent to the customer (not shown) from which *message1* emanated. This is achieved in conventional manner via the composer 44 and, say, the e-mail dispatcher 46.

25 After module 607, the distributor 40 returns to module 501 to retrieve the next entry from the distributor control table 304.

The invention is described above in the context of a
30 simple banking organization. It will be appreciated, however, that the invention is equally suitable for application other fields.

The invention is not limited to the embodiments described herein which may be modified or varied without departing from the scope of the invention.

1. A method of determining a value of a function $f(x)$ at a point x on a line segment AB , where A and B are the endpoints of the segment, and $f(A)$ and $f(B)$ are the values of the function at the endpoints, respectively, the method comprising the steps of: (a) dividing the segment AB into n equal parts by points P_1, P_2, \dots, P_{n-1} ; (b) determining the values of the function $f(P_1), f(P_2), \dots, f(P_{n-1})$ at the points P_1, P_2, \dots, P_{n-1} ; (c) approximating the value of the function $f(x)$ at the point x by the value of the function at the point P_i such that P_i is the point on the segment AB closest to x .

Claims:

1. An electronic message distributing apparatus for distributing electronic messages from a database to one or
5 more agents, the database storing, in respect of each electronic message to be distributed, a set of one or more message classes into which the respective electronic message is deemed to belong, the distributing apparatus comprising:
- 10 means for determining, from said database, at least one message class in which an electronic message is deemed to belong;
- 15 means for selecting, from a directory of one or more agents, an agent that has a capability to process electronic messages that belong to said at least one message class;
- 20 means for causing said electronic message to be rendered to said selected agent for processing thereby; and
- means for receiving from said selected agent a signal indicating that said electronic message is processed;
- 25 wherein, upon receipt of said signal, the distributing apparatus is arranged to determine, from said database, if said set includes one or more message classes in respect of which said electronic message is not processed and, in
30 response to determining that said electronic message has not been processed in respect one or more message classes in said set, is arranged to select a further agent to which to cause said electronic message to be rendered,

which further agent has a capability to process messages which belong to one or more of said unprocessed message classes.

5 2. An electronic message distributing apparatus as claimed in Claim 1, wherein each message class comprises a respective message group, each message group comprising one or more message categories.

10 3. An electronic message distributing apparatus as claimed in Claim 1, including means for recording that said electronic message is processed in respect of said at least one message class.

15 4. An electronic message distributing apparatus as claimed in Claim 1, wherein said agent directory includes, in respect of each agent, a set of one or more message classes in respect of which the respective agent has a capability of dealing with electronic messages, the
20 distributing apparatus including means for comparing said selected agent message classes set with said set of message classes into which the electronic message is deemed to belong, whereupon receipt of said signal from said selected agent, the distributing apparatus determines
25 that said electronic message is processed in respect of all message classes that are common to both of said message class sets.

5. An electronic message processing system for
30 distributing electronic messages amongst a plurality of agents, the system comprising:

a database arranged to store, in respect of each electronic message to be distributed, a set of one or more message classes into which the respective electronic message is deemed to belong; and

5

a directory of one or more agents, said directory including, in respect of each agent, a set of one or more message classes in respect of which the respective agent has a capability of dealing with electronic messages;

10

a distributing apparatus arranged to distribute electronic messages to one or more of said agents, the distributing apparatus comprising:

15

means for determining, from said database, at least one message class in which an electronic message is deemed to belong;

20

means for selecting, from said directory, an agent that has a capability to process electronic messages that belong to said at least one message class;

25

means for causing said electronic message to be rendered to said selected agent for processing thereby; and

means for receiving from said selected agent a signal indicating that said electronic message is processed;

30

wherein, upon receipt of said signal, the distributing apparatus is arranged to determine, from said database, if said set includes one or more message classes in respect of which said electronic message is not processed and, in

response to determining that said electronic message has not been processed in respect one or more message classes in said set, is arranged to select a further agent to which to cause said electronic message to be rendered,
5 which further agent has a capability to process messages which belong to one or more of said unprocessed message classes.

6. An electronic message processing system as claimed in
10 Claim 5, wherein each message class comprises a respective message group, each message group comprising one or more message categories.

7. An electronic message processing system as claimed in
15 Claim 5, wherein said distribution apparatus includes means for recording that said electronic message is processed in respect of said at least one message class.

8. An electronic message processing system as claimed in
20 Claim 5, wherein the distributing apparatus includes means for comparing said selected agent message classes set with said set of message classes into which the electronic message is deemed to belong, whereupon receipt of said signal from said selected agent, the distributing
25 apparatus determines that said electronic message is processed in respect of all message classes that are common to both of said message class sets.

9. An electronic message processing system as claimed in
30 Claim 5, wherein said database includes a first set of data records, said first data record set including one or more respective data records for each electronic message, each data record including means for identifying the

respective message to which it relates; and means for identifying a respective message class in which said respective message is deemed to belong.

5 10. An electronic message processing system as claimed in Claim 9, wherein each data record further includes status identifying means for indicating whether or not said
10 respective message has been processed by an agent in respect of said respective message class, the distribution apparatus being arranged to cause said status identifying means to be updated in response to said signal from said agent.

11. An electronic message processing system as claimed in
15 Claim 10, wherein the distributing apparatus is arranged to update the status identifier of each data record that relates to the message processed by said selected agent and that relates to a message class in respect of which said selected agent is capable of processing messages.

20 12. An electronic message processing system as claimed in Claim 9, wherein each data record further includes a priority identifier which indicates the relative priority of said data record in relation to the other data records
25 held in said first data record set in respect of the same electronic message, the distributing apparatus being arranged to select an agent that has a capability to process electronic messages belonging to the message class identified in the data record which has highest priority
30 and in respect of which message class the electronic message is not already processed.

13. An electronic message processing system as claimed in Claim 12, wherein the relative priority of data records for an electronic message is determined by the level of confidence with which said electronic message is deemed to belong to the message category identified in the respective data records.

14. An electronic message processing system as claimed in Claim 9, wherein message class identification means is a group identification means, where a group comprises one or more message categories.

15. An electronic message processing system as claimed in Claim 14, wherein said data records further include means for identifying one or more categories to which said respective electronic message is deemed to belong.

16. An electronic message processing system as claimed in Claim 9, including a classification apparatus, the classification apparatus comprising:

means for causing an electronic message to be classified into one or more message classes according to message content;

means for creating a respective data record, in said first data record set, for said one or more message classes.

17. An electronic message processing system as claimed in Claim 16, wherein each message class is associated with an indication of the confidence level with which said message class is assigned to the message, said database further including a second set of data records, said second data

record set including one or more respective data records
for each electronic message, each data record including
means for identifying the respective message to which it
relates; and means for identifying a respective message
5 class in which said respective message is deemed to
belong,

the classification apparatus being arranged to create a
data record, in said second set of data records, in
10 respect of the message class assigned to said electronic
message with the highest level of confidence,

the classification module being further arranged to
include in the or each data record in said first set of
15 data records an indication of the relative priority of
each data record,

wherein, the distributing apparatus is arranged to select
a data record from said second data record set and to
20 select an agent that is capable of processing messages
belonging to the message class identified in said selected
data record, the distributing apparatus being further
arranged, upon receipt of said signal from said agent, to
refer to said first set of data records and to create a
25 new entry in said second set of data records in respect of
the message class indicated in the data record in said
first set which bears the highest priority and in respect
of which message class the message has not been processed.

30 18. An electronic message processing system as claimed in
claim 5, wherein said agent directory includes means for
indicating the availability of each agent.

19. A message processing system as claimed in Claim 5, wherein said electronic messages include electronic mail messages (e-mails).

5 20. A message processing system as claimed in Claim 5, wherein said electronic messages include SMS (short message service) messages.

21. In an electronic message processing system for
10 distributing electronic messages amongst a plurality of agents, the system comprising: a database arranged to store, in respect of each electronic message to be distributed, a set of one or more message classes into which the respective electronic message is deemed to
15 belong; and a directory of one or more agents, said directory including, in respect of each agent, a set of one or more message classes in respect of which the respective agent has a capability of dealing with electronic messages, a method of processing electronic
20 messages, the method comprising:

determining, from said database, at least one message class in which an electronic message is deemed to belong;

25 selecting, from said directory, an agent that has a capability to process electronic messages that belong to said at least one message class;

causing said electronic message to be rendered to said
30 selected agent for processing thereby;

receiving from said selected agent a signal indicating that said electronic message is processed;

determining, upon receipt of said signal, if said set includes one or more message classes in respect of which said electronic message is not processed;

5

selecting, in response to determining that said electronic message has not been processed in respect one or more message classes in said set, a further agent to which to cause said electronic message to be rendered, which further agent has a capability to process messages which belong to one or more of said unprocessed message classes.

10

22. A method as claimed in claim 21, further including recording that said electronic message is processed in respect of said at least one message class.

15

23. A method as claimed in Claim 21, further including comparing said selected agent message classes set with said set of message classes into which the electronic message is deemed to belong, and, upon receipt of said signal from said selected agent, determining that said electronic message is processed in respect of all message classes that are common to both of said message class sets.

25

24. A method as claimed in Claim 22, wherein said database includes a first set of data records, said first data record set including one or more respective data records for each electronic message, each data record including means for identifying the respective message to which it relates; means for identifying a respective message class in which said respective message is deemed to belong; and status identifying means for indicating

30

whether or not said respective message has been processed
by an agent in respect of said respective message class,
the method further including causing said status
identifying means to be updated in response to said signal
5 from said agent.

25. A method as claimed in Claim 24, further including
updating the status identifier of each data record that
relates to the message processed by said selected agent
10 and that relates to a message class in respect of which
said selected agent is capable of processing messages.

26. A method as claimed in Claim 24, wherein each data
record further includes a priority identifier which
15 indicates the relative priority of said data record in
relation to the other data records held in said first data
record set in respect of the same electronic message, the
method further including selecting an agent that has a
capability to process electronic messages belonging to the
20 message class identified in the data record which has
highest priority and in respect of which message class the
electronic message is not already processed.

27. A method as claimed in Claim 26, wherein the relative
25 priority of data records for an electronic message is
determined by the level of confidence with which said
electronic message is deemed to belong to the message
category identified in the respective data records.

30 28. An method as claimed in Claim 24, wherein message
class identification means is a group identification
means, where a group comprises one or more message
categories.

29. A method as claimed in Claim 24, wherein the system includes a classification apparatus, the classification apparatus comprising means for causing an electronic message to be classified into one or more message classes according to message content; and means for creating a respective data record, in said first data record set, for said one or more message classes, wherein each message class is associated with an indication of the confidence level with which said message class is assigned to the message, said database further including a second set of data records, said second data record set including one or more respective data records for each electronic message, each data record including means for identifying the respective message to which it relates; and means for identifying a respective message class in which said respective message is deemed to belong, the method further including

creating a data record, in said second set of data records, in respect of the message class assigned to said electronic message with the highest level of confidence;

including in the or each data record in said first set of data records an indication of the relative priority of each data record;

selecting a data record from said second data record set;

selecting an agent that is capable of processing messages belonging to the message class identified in said selected data record;

creating, upon receipt of said signal from said agent, a
new entry in said second set of data records in respect of
the message class indicated in the data record in said
first set which bears the highest priority and in respect
5 of which message class the message has not been processed.

30. A computer program product comprising computer
program code stored on a computer usable storage medium
for, when executed on a computer system, processing
10 electronic messages in an electronic message processing
system for distributing electronic messages amongst a
plurality of agents, the system comprising: a database
arranged to store, in respect of each electronic message
to be distributed, a set of one or more message classes
15 into which the respective electronic message is deemed to
belong; and a directory of one or more agents, said
directory including, in respect of each agent, a set of
one or more message classes in respect of which the
respective agent has a capability of dealing with
20 electronic messages, a method of processing electronic
messages, the method comprising:

determining, from said database, at least one message
class in which an electronic message is deemed to belong;
25 selecting, from said directory, an agent that has a
capability to process electronic messages that belong to
said at least one message class;

30 causing said electronic message to be rendered to said
selected agent for processing thereby;

receiving from said selected agent a signal indicating
that said electronic message is processed;

5 determining, upon receipt of said signal, if said set
includes one or more message classes in respect of which
said electronic message is not processed;

10 selecting, in response to determining that said electronic
message has not been processed in respect one or more
message classes in said set, a further agent to which to
cause said electronic message to be rendered, which
further agent has a capability to process messages which
belong to one or more of said unprocessed message classes.

15

20

ABSTRACT

Electronic Message Distribution

5

The invention relates to the distribution of electronic messages which fall within one or more message classes or categories. One aspect of the invention provides an electronic message distributing apparatus for distributing
10 electronic messages from a database to one or more agents, the database storing, in respect of each electronic message to be distributes, a set of one or more message classes into which the message is deemed to belong. The apparatus causes the message to be rendered to one or more
15 agents in succession, each having the capability to deal with one or more of the message classes in said set, until the message is processed in respect of all message classes for which there is a capable agent. The invention removes the onus on individual agents to forward messages to other
20 agents if they cannot deal with all aspects of a message themselves. This reduces the likelihood that an inadequate response is sent to the customer

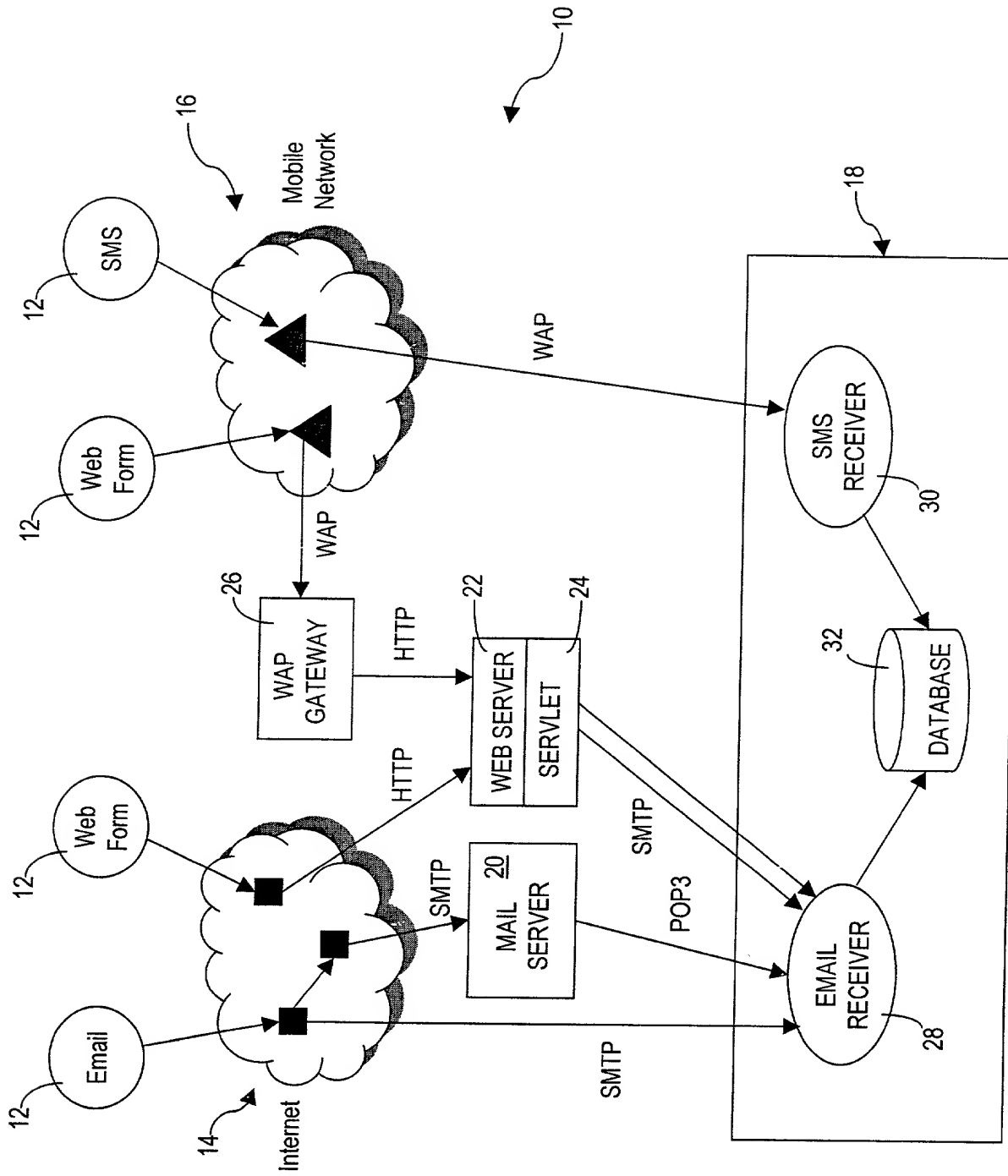


Fig. 1

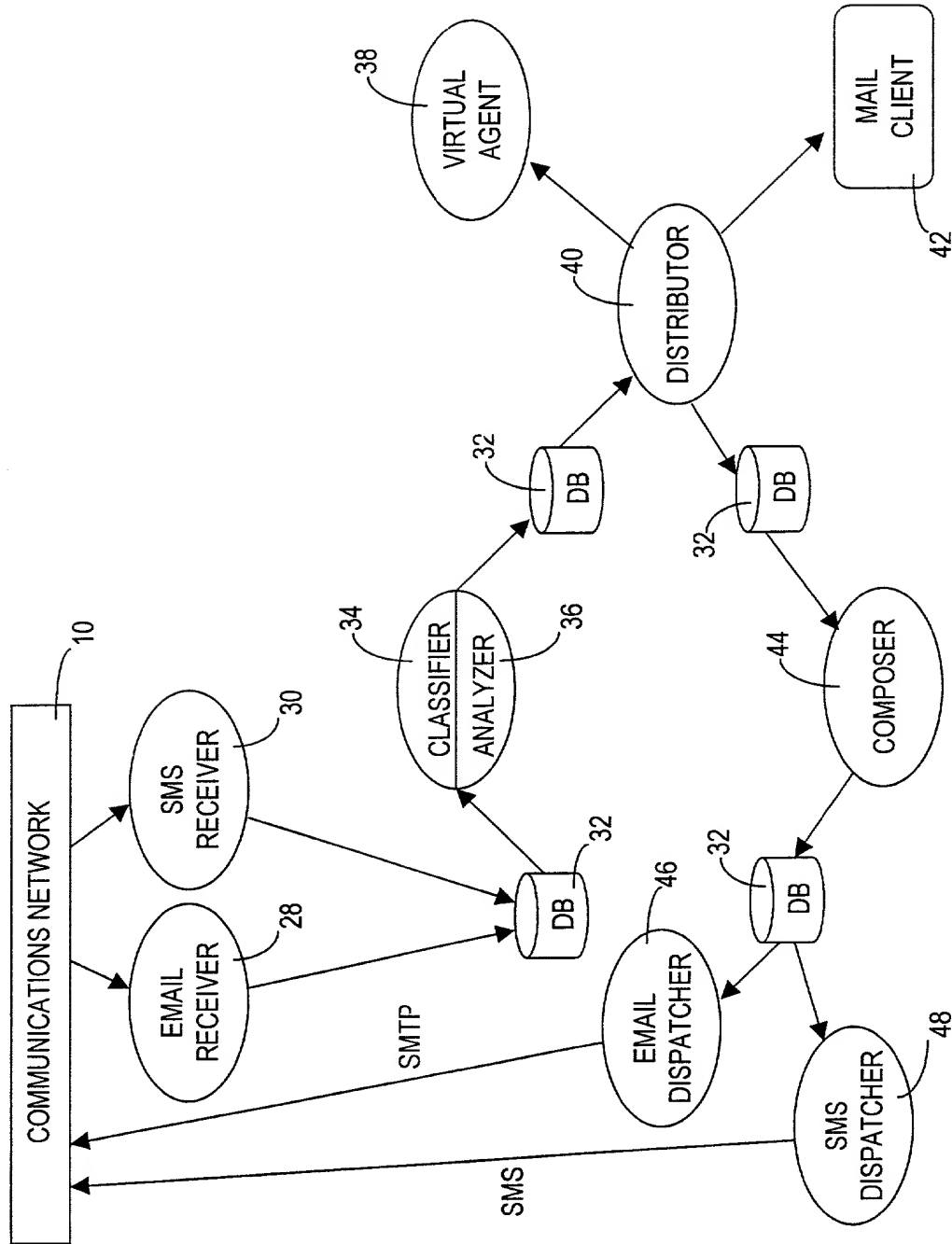


Fig. 2

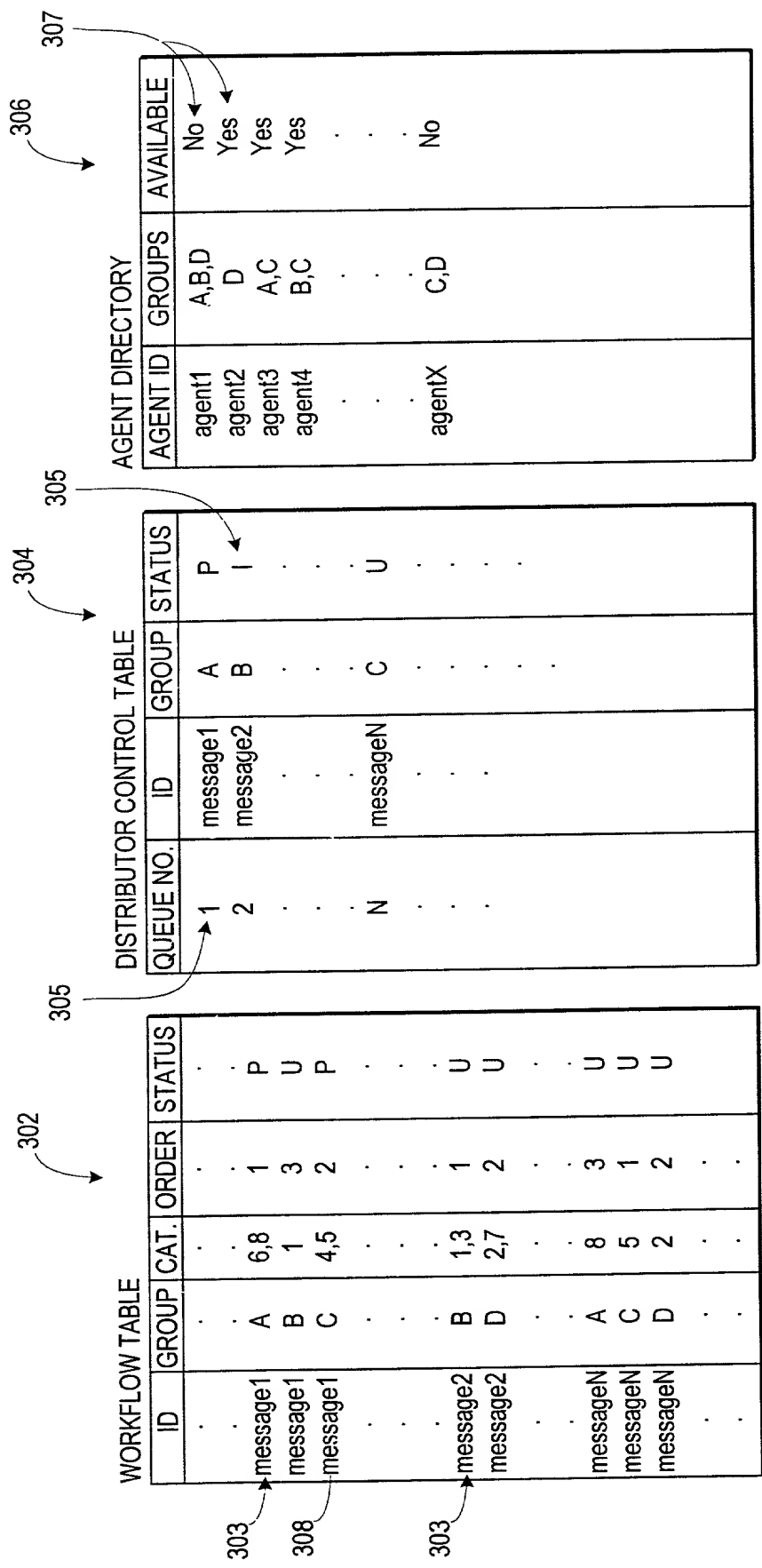
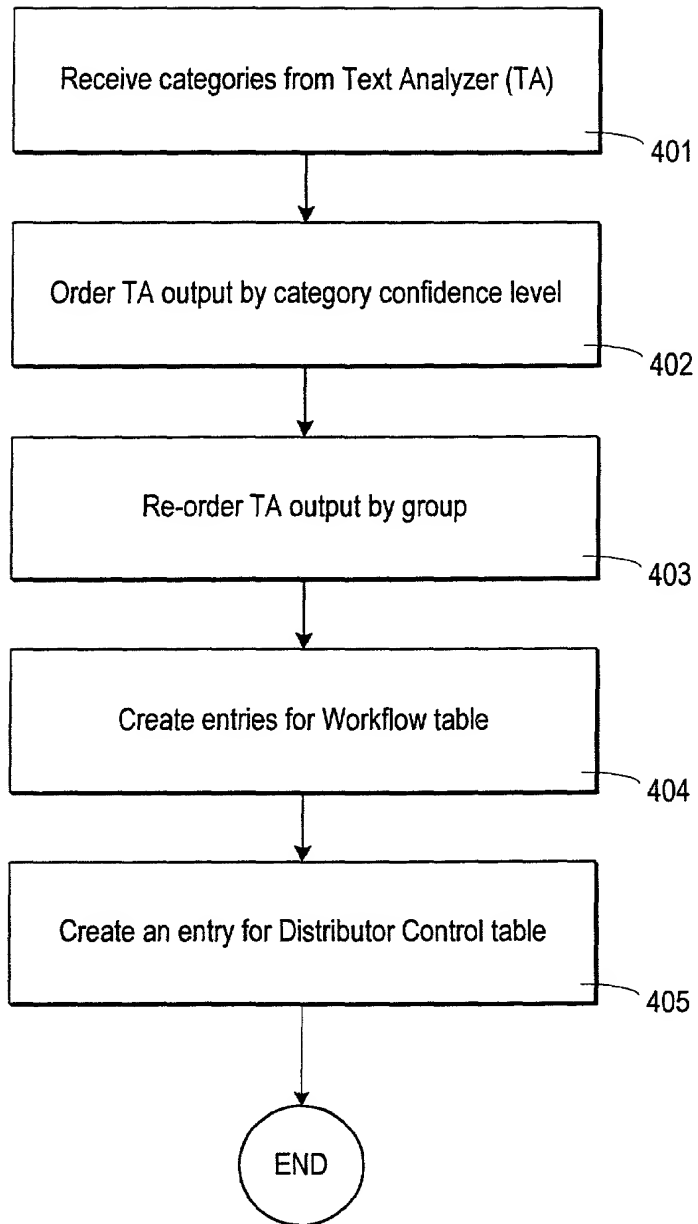


Fig. 3

Fig. 4

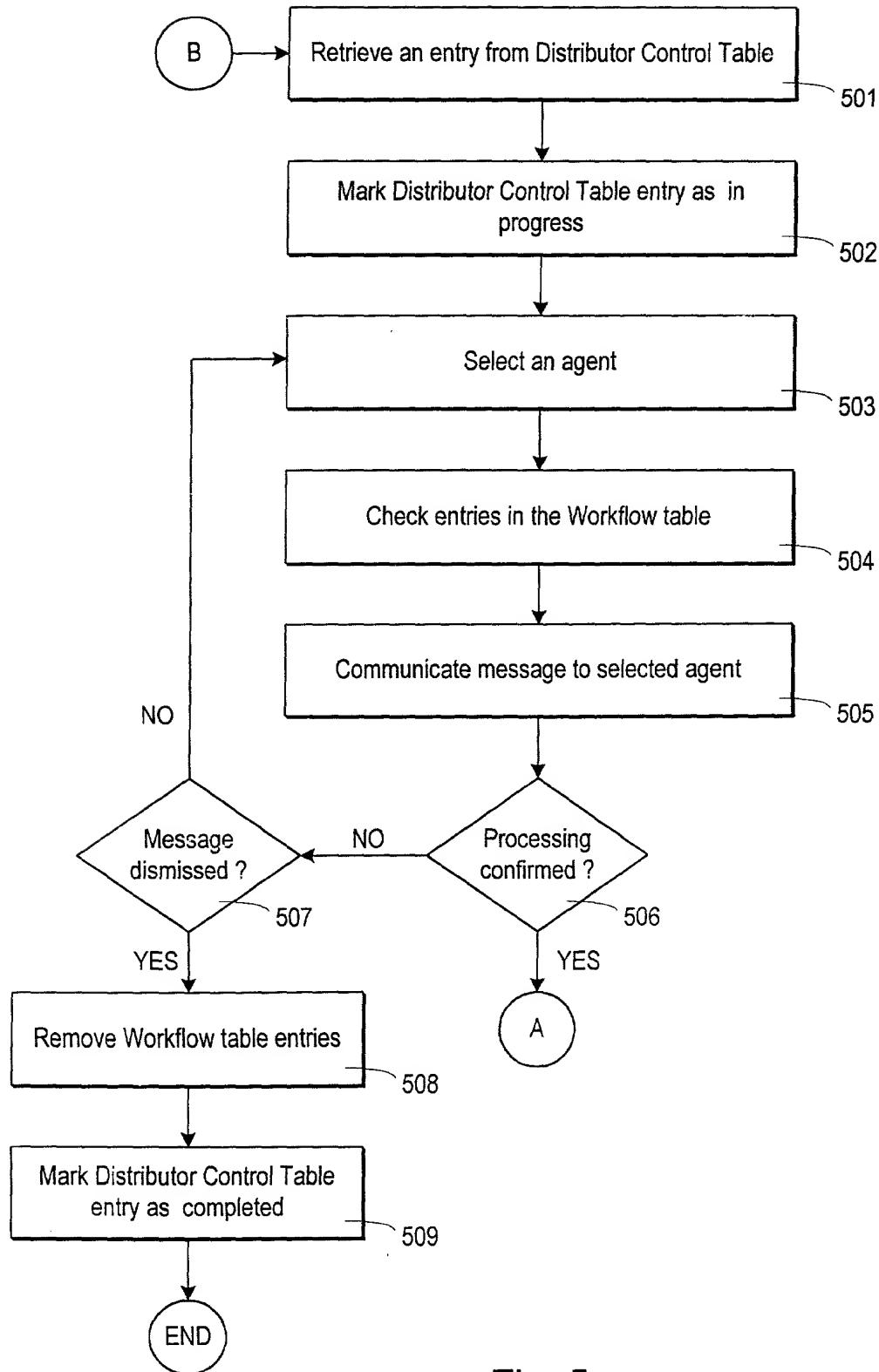
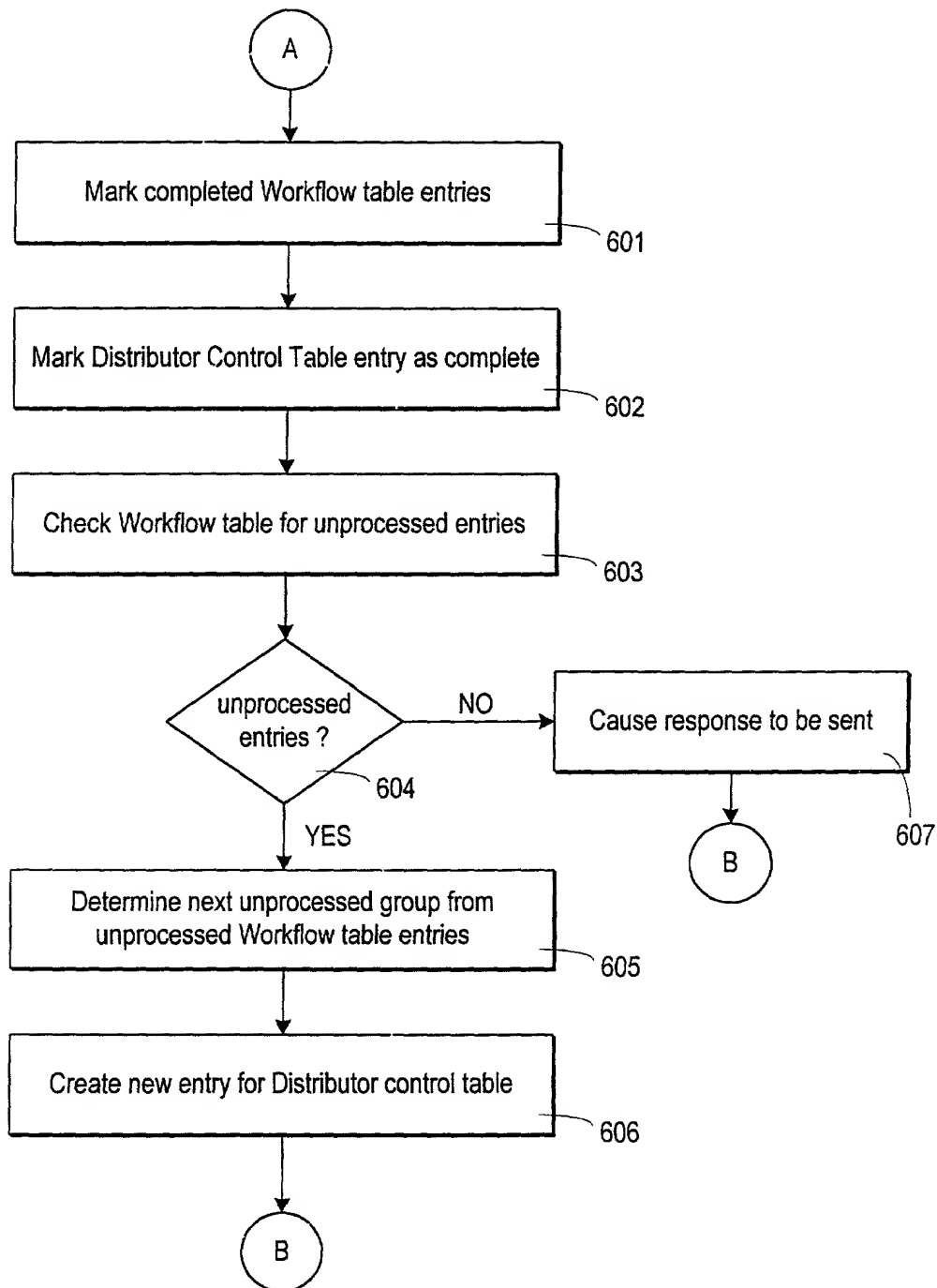


Fig. 5

Fig. 6

Declaration and Power of Attorney For Patent Application

English Language Declaration

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

ELECTRONIC MESSAGE DISTRIBUTION.

the specification of which is attached hereto unless the following box is checked:

☐ was filed on _____ as
United States Application Number or PCT International Application Number _____
and was amended on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR § 1.56.

I hereby claim foreign priority benefits under 35 U.S.C. § 119(a)-(d) or § 365(b) of any foreign application(s) for patent or inventor's certificate, or § 365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below by checking the box, any foreign application for patent or inventor's certificate, or PCT International application having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)

Priority Not Claimed

_____ (Number)	_____ (Country)	_____ (Day/Month/Year Filed)	<input type="checkbox"/>
_____ (Number)	_____ (Country)	_____ (Day/Month/Year Filed)	<input type="checkbox"/>

I hereby claim the benefit under 35 U.S.C. § 119(e) of any United States provisional application(s) listed below.

_____ (Application Number)	_____ (Filing Date)
_____ (Application Number)	_____ (Filing Date)

I hereby claim the benefit under 35 U.S.C. § 120 of any United States application(s), or 365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. § 112, I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR § 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Number)

(Filing Date)

(Status - patented, pending, abandoned)

(Application Number)

(Filing Date)

(Status - patented, pending, abandoned)

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith:

Paul F. Prestia	Reg. No. 23,031	Lawrence E. Ashery	Reg. No. 34,515	Jacques L. Elkowicz	Reg. No. 41,738
Alan Ratner	Reg. No. 19,717	Christopher R. Lewis	Reg. No. 36,201	Jack J. Jankovitz	Reg. No. 42,690
Andrew L. Ney	Reg. No. 20,300	Robert L. Andersen	Reg. No. 25,771	Jonathan H. Spadt	Reg. No. 45,122
Kenneth N. Nigon	Reg. No. 31,549	Joshua L. Cohen	Reg. No. 36,040	Christopher I. Halliday	Reg. No. 42,621
Kevin R. Casey	Reg. No. 32,117	Daniel N. Calder	Reg. No. 27,424	Scott A. McKeeown	Reg. No. 42,866
Benjamin E. Leace	Reg. No. 33,412	Louis W. Beardell, Jr.	Reg. No. 40,506		
James C. Simmons	Reg. No. 24,842				

Address all correspondence to: Kenneth N. Nigon

Ratner & Prestia, Suite 301, One Westlakes, Berwyn, P.O. Box 980, Valley Forge, PA 19482-0980

Address all telephone calls to: Kenneth N. Nigon at (610) 407-0700.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full name of sole or first inventor (given name, family name) Patrick McErlan

Inventor's signature X 

Date X 17/10/00

Residence 14 Ballymacpeake Road, Portlone, County Antrim, Northern Ireland, United Kingdom

Citizenship United Kingdom

Post Office Address 14 Ballymacpeake Road, Portlone, County Antrim, Northern Ireland, United Kingdom

☐ Additional inventors are being named on separately numbered sheets attached hereto.